PATENT ABSTRACTS OF JAPAN

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(54) VARIABLE LENGTH ENCODING METHOD AND VARIABLE LENGTH DECODING METHOD

(57)Abstract:
PROBLEM TO BE SOLVED: To improve an encoding efficiency of a variable length encoding when an image is divided into different-sized blocks and encoded.
SOLUTION: Number of coefficient of a periphery block is referred and a variable length encoding table is switched at a code row forming portion 104 when the number of the coefficient of an encoding objected block is encoded. When the sizes of the encoding objected block and the periphery block are differentthe number of the coefficient of the periphery block is converted so as to accord the size of the encoding objected block to the size of the periphery block.

CLAIMS

[Claim(s)]
[Claim 1]
It is the variable-length-coding method used when dividing a picture into two

or more blocks and coding by making said block into a unit
A variable-length-coding table used when coding information on a coding target blockA variable-length-coding method using information on said peripheral blocks for a size of said coding target block changing it when it determines according to information on peripheral blocks of said coding target block and sizes of said coding target block and said peripheral blocks differ.

[Claim 2]

A variable-length-coding method according to claim 1wherein said information is the number of a significant coefficient of a block.

[Claim 3]

It is the variable-length-coding method used when dividing a picture into two or more blocks and coding by making said block into a unit
A probability table used when coding information on a coding target blockA variable-length-coding method using information on said peripheral blocks for a size of said coding target block changing it when it determines according to information on peripheral blocks of said coding target block and sizes of said coding target block and said peripheral blocks differ.

[Claim 4]

A variable-length-coding method according to claim 3wherein said information is information which shows whether a block has a significant coefficient.

[Claim 5]

It is the variable-length-coding method used when dividing a picture into two or more blocks and coding by making said block into a unit
A variable-length-coding method using different probability tables according to a size of a coding target block when coding a coefficient value of a coding target block.

[Claim 6]

It is the variable-length-coding method used when dividing a picture into two or more blocks and coding by making said block into a unit
A variable-length-coding method using the same probability table regardless of a size of a coding target block when coding a coefficient value of a coding target block.

[Claim 7]

It is a variable length decoding method used when dividing a picture into two or more blocks and decrypting by making said block into a unit
A variable-length decryption table used when decrypting information on a decryption object blockA variable length decoding method using information on said peripheral blocks for a size of said decryption object block changing it when it determines according to information on peripheral blocks of said decryption object block and sizes of said decryption object block and said peripheral blocks differ.

[Claim 8]
The variable length decoding method according to claim 7wherein said information is the number of a significant coefficient of a block.
[Claim 9]
It is a variable length decoding method used when dividing a picture into two or more blocks and decrypting by making said block into a unit
A probability table used when decrypting information on a decryption object blockA variable length decoding method using information on said peripheral blocks for a size of said decryption object block changing it when it determines according to information on peripheral blocks of said decryption object block and sizes of said decryption object block and said peripheral blocks differ.
[Claim 10]
The variable length decoding method according to claim 9wherein said information is information which shows whether a block has a significant coefficient.
[Claim 11]
It is a variable length decoding method used when dividing a picture into two or more blocks and decrypting by making said block into a unit
A variable length decoding method using different probability tables according to a size of a decryption object block when decrypting a coefficient value of a decryption object block.
[Claim 12]
It is a variable length decoding method used when dividing a picture into two or more blocks and decrypting by making said block into a unit
A variable length decoding method using the same probability table regardless of a size of a decryption object block when decrypting a coefficient value of a decryption object block.
[Claim 13]
It is the variable-length-coding method used when dividing a picture into two or more blocks and coding by making said block into a unit
A variable-length-coding table used when coding information on a coding target blockWhen coding structures whether said coding target block and said peripheral blocks are coded by the frame structure by determining according to information on peripheral blocks of said coding target block or to be coded by field structure differSaid variable-length-coding table is determined from information on another peripheral blocks corresponding to said peripheral blocksand information on said peripheral blocks.
A variable-length-coding method characterized by things.
[Claim 14]
By a case where coding structures whether said coding target block and said

peripheral blocks are coded by the frame structure or to be coded by field structure differ. And when said variable-length-coding table cannot be determined from information on another peripheral blocks corresponding to said peripheral blocksand information on said peripheral blockssaid predetermined variable-length-coding table is used.
A variable-length-coding method according to claim 13 characterized by things.
[Claim 15]
Said information is the number of a significant coefficient of a block.
A variable-length-coding method according to claim 13 characterized by things.
[Claim 16]
When coding structures of said coding target block and said peripheral blocks differsaid variable-length-coding table is determined according to information acquired by equalizing information on another peripheral blocks corresponding to said peripheral blocksand information on said peripheral blocks.
A variable-length-coding method according to claim 13 characterized by things.
[Claim 17]
When coding structures of said coding target block and said peripheral blocks differinformation on said peripheral blocks is repealed and said variable-length-coding table is determined according to other information.
A variable-length-coding method according to claim 13 characterized by things.
[Claim 18]
The 1st peripheral blocks located leftward [of said coding target block] are contained in said peripheral blocks
When coding structures of said coding target block and said 1st peripheral blocks differSaid variable-length-coding table is determined according to information acquired by equalizing information on the 2nd peripheral blocks corresponding to said 1st peripheral blocksand information on said 1st peripheral blocksor information on said peripheral blocks is repealed and said variable-length-coding table is determined according to other information.
A variable-length-coding method according to claim 13 characterized by things.
[Claim 19]
The 3rd peripheral blocks located in above [of said coding target block] are contained in said peripheral blocks
When said coding target block is coded by the frame structure and said 3rd peripheral blocks are coded by field structureSaid variable-length-coding table is determined according to information acquired by equalizing information on the 4th peripheral blocks corresponding to said 3rd peripheral blocksand information on said 3rd peripheral blocksor information on said 3rd peripheral blocks is repealedand said variable-length-coding table is determined according to other information.
A variable-length-coding method according to claim 13 characterized by things.

[Claim 20]
The 3rd peripheral blocks located in above [of said coding target block] are contained in said peripheral blocks
When said coding target block is coded by field structure and said 3rd peripheral blocks are coded by field structuresaid variable-length-coding table is determined according to information on the 4th peripheral blocks corresponding to said 3 peripheral blocks.
A variable-length-coding method according to claim 13 characterized by things.
[Claim 21]
The 3rd peripheral blocks located in above [of said coding target block] are contained in said peripheral blocks
When said coding target block is coded by field structure and said 3rd peripheral blocks are coded by the frame structure. [whether said variable-length-coding table is determined according to information on said 3rd peripheral blocksand] Said variable-length-coding table is determined according to information acquired by equalizing information on the 4th peripheral blocks corresponding to said 3rd peripheral blocksand information on said 3rd peripheral blocksor information on said 3rd peripheral blocks is repealedand said variable-length-coding table is determined according to other information.
A variable-length-coding method according to claim 13 characterized by things.
[Claim 22]
The 1st peripheral blocks located leftward [of said coding target block] and the 2nd peripheral blocks located in above [of said coding target block] are contained in said peripheral blocks
Said variable-length-coding table is determined according to information acquired by equalizing information on said 1st peripheral blocksand information on said 2nd peripheral blocks.
A variable-length-coding method according to claim 13 characterized by things.
[Claim 23]
When either information on said 1st peripheral blocks and information on said 2nd peripheral blocks are invalidsaid variable-length-coding table is determined according to information on a way which is not invalid
When information on said 1st peripheral blocks and information on said 2nd peripheral blocks are invalidit is decided that it will be the variable-length-coding table decided beforehand.
A variable-length-coding method according to claim 13 characterized by things.
[Claim 24]
It is the variable-length-coding method used when dividing a picture into two or more blocks and coding by making said block into a unit
A probability table used when coding information on a coding target blockWhen

coding structures whether said coding target block and said peripheral blocks are coded by the frame structure by determining according to information on peripheral blocks of said coding target block or to be coded by field structure differSaid probability table is determined from information on another peripheral blocks corresponding to said peripheral blocksand information on said peripheral blocks.
A variable-length-coding method characterized by things.
[Claim 25]
By a case where coding structures whether said coding target block and said peripheral blocks are coded by the frame structure or to be coded by field structure differ. And when said probability table cannot be determined from information on another peripheral blocks corresponding to said peripheral blocksand information on said peripheral blockssaid predetermined probability table is used.
A variable-length-coding method according to claim 24 characterized by things.
[Claim 26]
Said information is information which shows whether a block has a significant coefficient.
A variable-length-coding method according to claim 24 characterized by things.
[Claim 27]
When coding structures of said coding target block and said peripheral blocks differsaid probability table is determined according to information acquired by inputting information on another peripheral blocks corresponding to said peripheral blocksand information on said peripheral blocks into the 1st function.
A variable-length-coding method according to claim 24 characterized by things.
[Claim 28]
When coding structure of said coding target block and said peripheral blocks is differentinformation on said peripheral blocks is repealed and said probability table is determined according to other information.
A variable-length-coding method according to claim 24 characterized by things.
[Claim 29]
The 1st peripheral blocks located leftward [of said coding target block] are contained in said peripheral blocks
When coding structures of said coding target block and said 1st peripheral blocks differSaid probability table is determined according to information acquired by inputting information on the 2nd peripheral blocks corresponding to said 1st peripheral blocksand information on said 1st peripheral blocks into the 1st functionor information on said peripheral blocks is made into a predetermined valueand said probability table is determined according to the predetermined value.

A variable-length-coding method according to claim 24 characterized by things.
[Claim 30]
The 3rd peripheral blocks located in above [of said coding target block] are contained in said peripheral blocks
When said coding target block is coded by the frame structure and said 3rd peripheral blocks are coded by field structureSaid probability table is determined according to information acquired by inputting information on the 4th peripheral blocks corresponding to said 3rd peripheral blocksand information on said 3rd peripheral blocks into the 1st functionor information on said 3rd peripheral blocks is made into a predetermined valueand said probability table is determined according to the predetermined value.
A variable-length-coding method according to claim 24 characterized by things.
[Claim 31]
The 3rd peripheral blocks located in above [of said coding target block] are contained in said peripheral blocks
When said coding target block is coded by field structure and said 3rd peripheral blocks are coded by field structuresaid probability table is determined according to information on the 4th peripheral blocks corresponding to said 3rd peripheral blocks.
A variable-length-coding method according to claim 24 characterized by things.
[Claim 32]
The 3rd peripheral blocks located in above [of said coding target block] are contained in said peripheral blocks
When said coding target block is coded by field structure and said 3rd peripheral blocks are coded by the frame structure. [whether said probability table is determined according to information on said 3rd peripheral blocksand] Said probability table is determined according to information acquired by inputting information on the 4th peripheral blocks corresponding to said 3rd peripheral blocksand information on said 3rd peripheral blocks into the 1st functionor information on said 3rd peripheral blocks is made into a predetermined valueand said probability table is determined according to the predetermined value.
A variable-length-coding method according to claim 24 characterized by things.
[Claim 33]
The 1st peripheral blocks located leftward [of said coding target block] and the 2nd peripheral blocks located in above [of said coding target block] are contained in said peripheral blocks
Said probability table is determined according to information acquired by inputting information on said 1st peripheral blocksand information on said 2nd peripheral blocks into the 2nd function.
A variable-length-coding method according to claim 24 characterized by things.

[Claim 34]
Said 1st function is either of the addition which carried out weighting to addition of a value which two information showslogical suma logical productand one information.
A variable-length-coding method according to claim 30 or 32 characterized by things.
[Claim 35]
Said 2nd function is either addition of a value which two information showsaddition which carried out weighting to one information and selection which considers only one side as an output.
A variable-length-coding method according to claim 33 characterized by things.
[Claim 36]
It is a variable length decoding method used when dividing a picture into two or more blocks and decrypting by making said block into a unit
A variable-length decryption table used when decrypting information on a decryption object blockWhen coding structures whether said decryption object block and said peripheral blocks are coded by the frame structure by determining according to information on peripheral blocks of said decryption object block or to be coded by field structure differSaid variable-length decryption table is determined from information on another peripheral blocks corresponding to said peripheral blocksand information on said peripheral blocks.
A variable length decoding method characterized by things.
[Claim 37]
By a case where coding structures whether said decryption object block and said peripheral blocks are coded by the frame structure or to be coded by field structure differ. And when said variable-length decryption table cannot be determined from information on another peripheral blocks corresponding to said peripheral blocksand information on said peripheral blockssaid predetermined variable-length decryption table is used.
The variable length decoding method according to claim 36 characterized by things.
[Claim 38]
Said information is the number of a significant coefficient of a block.
The variable length decoding method according to claim 36 characterized by things.
[Claim 39]
When coding structures of said decryption object block and said peripheral blocks differsaid variable-length decryption table is determined according to information acquired by equalizing information on another peripheral blocks corresponding to said peripheral blocksand information on said peripheral

blocks.
The variable length decoding method according to claim 36 characterized by things.
[Claim 40]
When coding structure of said decryption object block and said peripheral blocks is differentinformation on said peripheral blocks is repealed and said variable-length decryption table is determined according to other information.
The variable length decoding method according to claim 36 characterized by things.
[Claim 41]
The 1st peripheral blocks located leftward [of said decryption object block] are contained in said peripheral blocks
When coding structures of said decryption object block and said 1st peripheral blocks differ. [whether said variable-length decryption table is determined according to information acquired by inputting information on the 2nd peripheral blocks corresponding to said 1st peripheral blocksand information on said 1st peripheral blocks into the 1st functionand] Or information on said peripheral blocks is made into a predetermined valueand said variable-length decryption table is determined according to the predetermined value.
The variable length decoding method according to claim 36 characterized by things.
[Claim 42]
The 3rd peripheral blocks located in above [of said decryption object block] are contained in said peripheral blocks
When said decryption object block is coded by the frame structure and said 3rd peripheral blocks are coded by field structure. [whether said variable-length decryption table is determined according to information acquired by inputting information on the 4th peripheral blocks corresponding to said 3rd peripheral blocksand information on said 3rd peripheral blocks into the 1st functionand] Or information on said 3rd peripheral blocks is made into a predetermined valueand said variable-length decryption table is determined according to the predetermined value.
The variable length decoding method according to claim 36 characterized by things.
[Claim 43]
The 3rd peripheral blocks located in above [of said decryption object block] are contained in said peripheral blocks
When said decryption object block is coded by field structure and said 3rd peripheral blocks are coded by field structuresaid variable-length decryption table is determined according to information on the 4th peripheral blocks corresponding to said 3rd peripheral blocks.

The variable length decoding method according to claim 36 characterized by things.
[Claim 44]
The 3rd peripheral blocks located in above [of said decryption object block] are contained in said peripheral blocks
When said decryption object block is coded by field structure and said 3rd peripheral blocks are coded by the frame structure. [whether said variable-length decryption table is determined according to information on said 3rd peripheral blocksand] . [whether said variable-length decryption table is determined according to information acquired by inputting information on the 4th peripheral blocks corresponding to said 3rd peripheral blocksand information on said 3rd peripheral blocks into the 1st functionand] Or information on said 3rd peripheral blocks is made into a predetermined valueand said variable-length decryption table is determined according to the predetermined value.
The variable length decoding method according to claim 36 characterized by things.
[Claim 45]
The 1st peripheral blocks located leftward [of said decryption object block] and the 2nd peripheral blocks located in above [of said decryption object block] are contained in said peripheral blocks
Said variable-length decryption table is determined according to information acquired by inputting information on said 1st peripheral blocksand information on said 2nd peripheral blocks into the 2nd function.
The variable length decoding method according to claim 36 characterized by things.
[Claim 46]
Said 1st function is either of the addition which carried out weighting to addition of a value which two information showslogical suma logical productand one information.
The variable length decoding method according to claim 42 or 44 characterized by things.
[Claim 47]
Said 2nd function is either addition of a value which two information showsaddition which carried out weighting to one information and selection which considers only one side as an output.
The variable length decoding method according to claim 45 characterized by things.
[Claim 48]
The 1st peripheral blocks located leftward [of said decryption object block] and the 2nd peripheral blocks located in above [of said decryption object

block] are contained in said peripheral blocks
Said variable-length decryption table is determined according to information acquired by equalizing information on said 1st peripheral blocksand information on said 2nd peripheral blocks.
The variable length decoding method according to claim 36 characterized by things.
[Claim 49]
When either information on said 1st peripheral blocks and information on said 2nd peripheral blocks are invalidsaid variable-length decryption table is determined according to information on a way which is not invalid
When information on said 1st peripheral blocks and information on said 2nd peripheral blocks are invalidit is decided that it will be the variable-length decryption table decided beforehand.
The variable length decoding method according to claim 36 characterized by things.
[Claim 50]
It is a variable length decoding method used when dividing a picture into two or more blocks and decrypting by making said block into a unit
A probability table used when decrypting information on a decryption object blockWhen coding structures whether said decryption object block and said peripheral blocks are coded by the frame structure by determining according to information on peripheral blocks of said decryption object block or to be coded by field structure differSaid probability table is determined from information on another peripheral blocks corresponding to said peripheral blocksand information on said peripheral blocks.
A variable length decoding method characterized by things.
[Claim 51]
By a case where coding structures whether said decryption object block and said peripheral blocks are coded by the frame structure or to be coded by field structure differ. And when said probability table cannot be determined from information on another peripheral blocks corresponding to said peripheral blocksand information on said peripheral blockssaid predetermined probability table is used.
The variable length decoding method according to claim 50 characterized by things.
[Claim 52]
Said information is information which shows whether a block has a significant coefficient.
The variable length decoding method according to claim 50 characterized by things.
[Claim 53]

When coding structures of said decryption object block and said peripheral blocks differsaid probability table is determined according to information acquired by inputting information on another peripheral blocks corresponding to said peripheral blocksand information on said peripheral blocks into the 1st function.
The variable length decoding method according to claim 50 characterized by things.
[Claim 54]
When coding structure of said decryption object block and said peripheral blocks is differentinformation on said peripheral blocks is repealed and said probability table is determined according to other information.
The variable length decoding method according to claim 50 characterized by things.
[Claim 55]
The 1st peripheral blocks located leftward [of said decryption object block] and the 2nd peripheral blocks located in above [of said decryption object block] are contained in said peripheral blocks
Said probability table is determined according to information acquired by inputting information on said 1st peripheral blocksand information on said 2nd peripheral blocks into a function.
The variable length decoding method according to claim 50 characterized by things.
[Claim 56]
It is a variable length coding device which divides a picture into two or more blocksand codes by making said block into a unit
A table determination means to determine a variable-length-coding table used when coding information on a coding target block according to information on peripheral blocks of said coding target block
It has an encoding means which performs a variable length code using a determined variable-length-coding table
When coding structures whether said coding target block and said peripheral blocks are coded by the frame structure or to be coded by field structure differsaid table determination meansSaid variable-length-coding table is determined from information on another peripheral blocks corresponding to said peripheral blocksand information on said peripheral blocksor said variable-length-coding table of a predetermined procedure is determined.
A variable length coding device characterized by things.
[Claim 57]
It is a variable length coding device which divides a picture into two or more blocksand codes by making said block into a unit
A table determination means to determine a probability table used when coding

information on a coding target block according to information on peripheral blocks of said coding target block
It has an encoding means which performs a variable length code using a determined probability table
When coding structures whether said coding target block and said peripheral blocks are coded by the frame structure or to be coded by field structure differsaid table determination meansSaid probability table is determined from information on another peripheral blocks corresponding to said peripheral blocksand information on said peripheral blocksor said probability table of a predetermined procedure is determined.
A variable length coding device characterized by things.
[Claim 58]
It is a variable length decoding device which divides a picture into two or more blocksand decrypts by making said block into a unit
A table determination means to determine a variable-length decryption table used when decrypting information on a decryption object block according to information on peripheral blocks of said decryption object block
It has an encoding means which performs a variable length code using a determined variable-length-coding table
When coding structures whether said decryption object block and said peripheral blocks are coded by the frame structure or to be coded by field structure differsaid table determination meansSaid variable-length decryption table is determined from information on another peripheral blocks corresponding to said peripheral blocksand information on said peripheral blocksor said variable-length decryption table of a predetermined procedure is determined.
A variable length decoding device characterized by things.
[Claim 59]
It is a variable length decoding device which divides a picture into two or more blocksand decrypts by making said block into a unit
A table determination means to determine a probability table used when decrypting information on a decryption object block according to information on peripheral blocks of said decryption object block
It has an encoding means which performs a variable length code using a determined probability table
When coding structures whether said decryption object block and said peripheral blocks are coded by the frame structure or to be coded by field structure differsaid table determination meansSaid probability table is determined from information on another peripheral blocks corresponding to said peripheral blocksand information on said peripheral blocksor said probability table of a predetermined procedure is determined.

A variable length decoding device characterized by things.
[Claim 60]
It is a program for a variable length coding device which divides a picture into two or more blocksand codes by making said block into a unit
A table determination step which determines a variable-length-coding table used when coding information on a coding target block according to information on peripheral blocks of said coding target block
A coding step which performs a variable length code using a determined variable-length-coding table is included
When coding structures whether said coding target block and said peripheral blocks are coded by the frame structure or to be coded according to field structure differ in said table determination stepSaid variable-length-coding table is determined from information on another peripheral blocks corresponding to said peripheral blocksand information on said peripheral blocksor said variable-length-coding table of a predetermined procedure is determined.
A program characterized by things.
[Claim 61]
It is a program for a variable length coding device which divides a picture into two or more blocksand codes by making said block into a unit
A table determination step which determines a probability table used when coding information on a coding target block according to information on peripheral blocks of said coding target block
A coding step which performs a variable length code using a determined probability table is included
When coding structures whether said coding target block and said peripheral blocks are coded by the frame structure or to be coded according to field structure differ in said table determination stepSaid probability table is determined from information on another peripheral blocks corresponding to said peripheral blocksand information on said peripheral blocksor said probability table of a predetermined procedure is determined.
A program characterized by things.
[Claim 62]
It is a program for a variable length decoding device which divides a picture into two or more blocksand decrypts by making said block into a unit
A table determination step which determines a variable-length decryption table used when decrypting information on a decryption object block according to information on peripheral blocks of said decryption object block
A coding step which performs a variable length code using a determined variable-length-coding table is included
When coding structures whether said decryption object block and said

peripheral blocks are coded by the frame structure or to be coded according to field structure differ in said table determination stepSaid variable-length decryption table is determined from information on another peripheral blocks corresponding to said peripheral blocksand information on said peripheral blocksor said variable-length decryption table of a predetermined procedure is determined.
A program characterized by things.
[Claim 63]
It is a program for a variable length decoding device which divides a picture into two or more blocksand decrypts by making said block into a unit
A table determination step which determines a probability table used when decrypting information on a decryption object block according to information on peripheral blocks of said decryption object block
A coding step which performs a variable length code using a determined probability table is included
When coding structures whether said decryption object block and said peripheral blocks are coded by the frame structure or to be coded according to field structure differ in said table determination stepSaid probability table is determined from information on another peripheral blocks corresponding to said peripheral blocksand information on said peripheral blocksor said probability table of a predetermined procedure is determined.
A program characterized by things.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]
This invention relates to the variable-length-coding method and variable length decoding method at the time of carrying out compression extension of the picture signal.
[0002]
[Description of the Prior Art]
Two methodsa context adaptive variable-length-coding (henceforthCAVLC) method and a context adaptive binary arithmetic coding (henceforthCABAC) methodare defined as the variable-length-coding method by H.264 coding mode to which the present standards work is performed.
[0003]
In a CAVLC methodencoding efficiency is raised by changing a VLC table accommodative using the information on peripheral blocks (context)etc. In a

CABAC methodencoding efficiency is raised by changing a probability table according to a context.
[0004]
In a CAVLC methodhow to code or decrypt the number of the significant coefficient within a block is explained. A significant coefficient is a coefficient whose coefficient value is not 0 here. In drawing 5the block C is a block which is trying to perform variable length codingand suppose that it is the blocks A and B the block located in the left of the block Cand a toprespectively. For exampleby H.264 methodeach block is not concerned with the size of a motion compensationbut frequency conversion is carried out in 4 pixels of levelsand the size of 4 pixels of perpendiculars hereand the maximum of the number of a significant coefficient is set to 16. In this caseboth the blocks A and B are in a screenand supposing it is in the same slicetwo average value will be calculated from the number of the significant coefficient of the blocks A and Band the VLC table used with that value will be changed. for examplethe case where average value is five or more about VLC1 of drawing 4 when average value is 0 or 1 and average value is 2 or 3 about VLC0 of drawing 4 -- VLC2 of drawing 4 -- it uses so that it may say.
[0005]
Nextin a CABAC methodhow to code or decrypt the bit (CBP bit) which shows whether each block has a significant coefficient is explained. In drawing 5the block C is a block which is trying to perform variable length codingand suppose that it is the blocks A and B the block located in the left of the block Cand a toprespectively. In this casesupposing both the blocks A and B are in a screenand it is in the same slice and it is the same kind as the block C of block (all of ABand C are luminance-signal blocks)It asks for whether it is which pattern in four kinds of whether the blocks A and B have a significant coefficient of combination. And the probability table used with the pattern when carrying out arithmetic coding of the CBP bit is chosen from four.
[0006]
Nextin a CABAC methodhow to code or decrypt the bit which shows whether each coefficient within a block is a significant coefficient is explained. Drawing 6 shows what rearranged the coefficient within a block at the predetermined scanning order foreword. By H.264 methodthe method of scanning from low frequency components to zigzag order to a high frequency component is used here. Under the present circumstanceswhether each coefficient is a significant coefficient expresses by the bit called a SIG bit and a LAST bitand it carries out arithmetic coding of these bits. A SIG bit is set to 0 herewhen 1 and a coefficient value are 0 in the case of a significant coefficient. A LAST bit is assigned only to a significant coefficientwhen the significant coefficient

is a coefficient of the last within a blockit is set to 1and when that is not rightit is set to 0. The probability table at the time of carrying out arithmetic coding of a SIG bit and the LAST bit hereIt is prepared according to the kind (for examplethe prediction luminance-signal block in a screena picture prediction luminance-signal blockthe prediction color-difference-signal block in a screena picture prediction color-difference-signal blocketc.) of blockand is further prepared for each coefficient position (position in scanning order) of every to the kind of each block. Thereforefor examplewhen the kind of a certain block has a maximum of 16 coefficients15 probability tables are used at a time to each of a SIG bit and a LAST bit. Whenas for thisa significant coefficient exists in the 16thit is because it is not necessary to code the last coefficient.

[0007]

As a context which becomes a factor which chooses a probability table in a CABAC methodeverything but above-mentioned CBPa SIG bitand a LAST bit -- intra -- there are items -- whether it is a macro blockis a skip macro blockare a direct mode macro blocka reference picture number is 0or difference QP is 0. And the context value of an object block is determined using the value of the block located in the left of the block which is the target of arithmetic codingand a top about these contextsand variable length coding is performed using the probability table corresponding to the value. The bit string to which variable length coding was performed is described in a code sequenceas shown in drawing 24. In drawing 24the probability table is shown under each information. For examplein carrying out variable length coding of MB_type which is the coding mode of a macro blockit shows using four probability tables (MB0-MB3) according to a context value.

[0008]

[Problem(s) to be Solved by the Invention]

Howeverin the CAVLC method and CABAC method of the above-mentioned formerSince the selection method of a VLC table or a probability table is defined based on the premise that the size of a frequency conversion block (it is only hereafter called transformation blocks) has the same sizeWhen the size of transformation blocks is not constantit has the problem that these methods cannot be used.

[0009]

The CAVLC method and CABAC method of the above-mentioned former also have the problem that it does not correspond when a picture signal is an interlace signal. That issince coding and decryption will be performed by a frame or field structure for every block to an interlace signalthe case where it is coded/decrypted with the structure where the blocks located in the block and the left for coding/decryptionor a top differ occursbut. The deciding method

of variable length coding in the case of such an interlace signal is not defined by a conventional CAVLC method and CABAC method.
[0010]
Thenthis invention solves the above-mentioned problem.
When the size of transformation blocks is not constant and a CAVLC method and a CABAC method are used for the purpose as the variable-length-coding methodit is providing the variable-length-coding method and variable length decoding method which realize the selection method of the VLC table and probability table whose encoding efficiency improves.

[0011]
When a picture signal is an interlace signal and a CAVLC method and a CABAC method are used for this invention as the variable-length-coding methodIt aims also at providing the variable-length-coding method and variable length decoding method which realize the selection method of the VLC table and probability table whose encoding efficiency improves.
[0012]
[Means for Solving the Problem]
To achieve the above objectsa variable-length-coding method of this inventionAccording to composition of claim 1 and claim 2a picture is divided into two or more blocksIt is the variable-length-coding method used when coding by making said block into a unitA variable-length-coding table used when coding information on a coding target blockWhen it determines according to information on peripheral blocks of said coding target block and sizes of said coding target block and said peripheral blocks differit has using information on said peripheral blocks for a size of said coding target blockchanging it as a feature.
[0013]
According to composition of claim 2 and claim 3a variable-length-coding method of this invention. It is the variable-length-coding method used when dividing a picture into two or more blocks and coding by making said block into a unitA probability table used when coding information on a coding target blockWhen it determines according to information on peripheral blocks of said coding target block and sizes of said coding target block and said peripheral blocks differit has using information on said peripheral blocks for a size of said coding target blockchanging it as a feature.
[0014]
According to composition of claim 5a variable-length-coding method of this invention divides a picture into two or more blocksIt is the variable-length-coding method used when coding by making said block into a unitand when coding a coefficient value of a coding target blockit has using different probability

tables according to a size of a coding target block as a feature.
[0015]
According to composition of claim 6a variable-length-coding method of this invention divides a picture into two or more blocksIt is the variable-length-coding method used when coding by making said block into a unitand when coding a coefficient value of a coding target blockit has using the same probability table regardless of a size of a coding target block as a feature.
[0016]
According to composition of claim 7 and claim 8a variable length decoding method of this invention. It is a variable length decoding method used when dividing a picture into two or more blocks and decrypting by making said block into a unitA variable-length decryption table used when decrypting information on a decryption object blockWhen it determines according to information on peripheral blocks of said decryption object block and sizes of said decryption object block and said peripheral blocks differit has using information on said peripheral blocks for a size of said decryption object blockchanging it as a feature.
[0017]
According to composition of claim 9 and claim 10a variable length decoding method of this invention. It is a variable length decoding method used when dividing a picture into two or more blocks and decrypting by making said block into a unitA probability table used when decrypting information on a decryption object blockWhen it determines according to information on peripheral blocks of said decryption object block and sizes of said decryption object block and said peripheral blocks differit has using information on said peripheral blocks for a size of said decryption object blockchanging it as a feature.
[0018]
According to composition of claim 11a variable length decoding method of this invention divides a picture into two or more blocksIt is a variable length decoding method used when decrypting by making said block into a unitand when decrypting a coefficient value of a decryption object blockit has using different probability tables according to a size of a decryption object block as a feature.
[0019]
According to composition of claim 12a variable length decoding method of this invention divides a picture into two or more blocksIt is a variable length decoding method used when decrypting by making said block into a unitand when decrypting a coefficient value of a decryption object blockit has using the same probability table regardless of a size of a decryption object block as a feature.

[0020]
A variable-length-coding method of this invention divides a picture into two or more blocksIt is the variable-length-coding method used when coding by making said block into a unitA variable-length-coding table used when coding information on a coding target blockWhen coding structures whether said coding target block and said peripheral blocks are coded by the frame structure by determining according to information on peripheral blocks of said coding target block or to be coded by field structure differSaid variable-length-coding table is determined from information on another peripheral blocks corresponding to said peripheral blocksand information on said peripheral blocksor said variable-length-coding table of a predetermined procedure is determined.
[0021]
A variable-length-coding method of this invention divides a picture into two or more blocksIt is the variable-length-coding method used when coding by making said block into a unitA probability table used when coding information on a coding target blockWhen coding structures whether said coding target block and said peripheral blocks are coded by the frame structure by determining according to information on peripheral blocks of said coding target block or to be coded by field structure differSaid probability table is determined from information on another peripheral blocks corresponding to said peripheral blocksand information on said peripheral blocksor said probability table of a predetermined procedure is determined.
[0022]
A variable length decoding method of this invention divides a picture into two or more blocksIt is a variable length decoding method used when decrypting by making said block into a unitA variable-length decryption table used when decrypting information on a decryption object blockWhen coding structures whether said decryption object block and said peripheral blocks are coded by the frame structure by determining according to information on peripheral blocks of said decryption object block or to be coded by field structure differSaid variable-length decryption table is determined from information on another peripheral blocks corresponding to said peripheral blocksand information on said peripheral blocksor said variable-length decryption table of a predetermined procedure is determined.
[0023]
A variable length decoding method of this invention divides a picture into two or more blocksIt is a variable length decoding method used when decrypting by making said block into a unitA probability table used when decrypting information on a decryption object blockWhen coding structures whether said decryption object block and said peripheral blocks are coded by the frame

structure by determining according to information on peripheral blocks of said decryption object block or to be coded by field structure differSaid probability table is determined from information on another peripheral blocks corresponding to said peripheral blocksand information on said peripheral blocksor said probability table of a predetermined procedure is determined.
[0024]
This invention is not only realizable as an above-mentioned variable-length-coding method and a variable length decoding methodbutThe feature procedure included in these methods can be realized as a variable length coding device and a variable length decoding device which it has as a meansor those procedures can also be realized as a program which a computer is made to execute. And it cannot be overemphasized that such a program can be circulated via transmission mediasuch as recording mediasuch as CD-ROMand the Internet.
[0025]
[Embodiment of the Invention]
An embodiment of the invention is described with reference to drawings.
[0026]
(Embodiment 1)
Firstoverall operation of video coding equipment is explained using drawing 1. Drawing 1The frame memory 101the difference operation part 102the prediction error coding part 103the code string generation part 104the prediction error decoding section 105the add operation part 106the frame memory 107the motion vector primary detecting element 108the mode selection part 109the encoding controlling part 110It is a block diagram of the video coding equipment which comprises the switches 111-115.
[0027]
Each picture to which rearrangement was performed by the frame memory 101 presupposes that it is read in the unit of a macro block. Herea macro block presupposes that it is a size of 16 pixels of level 16x perpendiculars. A motion compensation shall be performed by the block unit of 16x1616x88x168x88x44x8and 4x4. Suppose that the block which has 16 pixels of levels and a size of 8 pixels of perpendiculars is shown in 16x8 here. Herecoding of a forward-addressing prediction-coding picture (P picture) is explained as an example.
[0028]
In coding of P picturethe encoding controlling part 110 carries out the switch 113 to one. When P picture is used as a reference picture of other pictureseach switch is controlled so that the switches 114 and 115 are turned on. When not used as a reference picture of other picturesthe switches 114 and 115 control each switch to be come by off. Thereforethe macro block of P picture read from the frame memory 101 is first inputted into the motion

vector primary detecting element 108the mode selection part 109and the difference operation part 102.
[0029]
In the motion vector primary detecting element 108the front motion vector of each block included in a macro block is detected by using the decryption image data of the reference picture accumulated in the frame memory 107 as a forward-addressing picture.
[0030]
In the mode selection part 109the coding mode of a macro block is determined using the motion vector detected in the motion vector primary detecting element 108. Herethe coding mode of P picture presupposes that it can choose from the formation of a picture inner codeand prediction coding between pictures by forward addressingfor example. When prediction coding between pictures by forward addressing is usedthe information whether a macro block is divided into what kind of blockand a motion compensation is carried out is also included in coding mode.
[0031]
The coding mode determined by the mode selection part 109 is outputted to the code string generation part 104. The image comparison based on the coding mode determined by the mode selection part 104 is outputted to the difference operation part 102 and the add operation part 106. Howeveran image comparison is not outputted when picture inner code-ization is chosen. When it controls to connect the switch 111 to a and to connect the switch 112 to cwhen picture inner code-ization is chosen by the mode selection part 109 and prediction coding between pictures is chosenit controls to connect the switch 111 to b and to connect the switch 112 to d. Belowthe case where prediction coding between pictures is chosen by the mode selection part 109 is explained.
[0032]
An image comparison is inputted into the difference operation part 102 from the mode selection part 109. In the difference operation part 109the difference of the macro block of P picture and an image comparison is calculatedand a prediction error image is generated and outputted.
[0033]
A prediction error image is inputted into the prediction error coding part 103. In the prediction error coding part 103coding data is generated and outputted by performing coding processing of frequency conversionquantizationetc. to the inputted prediction error image. Herefrequency conversion to a prediction error image shall be performed based on the size of the motion compensation determined in the mode selection part 109. For examplewhen frequency conversion is carried out in the size of 8x8 when a motion compensation is carried out in 8x8 or more sizesand a motion compensation is carried out in

less than 8x8 sizefrequency conversion shall be carried out in the same size as a motion compensation. The coding data outputted from the prediction error coding part 103 is inputted into the code string generation part 104.
[0034]
In the code string generation part 104to the inputted coding datavariable length coding etc. are performedand a code sequence is generated and outputted by adding the informationincluding coding modeheader informationetc. that it was inputted from the mode selection part 109.
[0035]
Nextoverall operation of a video decoding device is explained using drawing 3. Drawing 3It is a block diagram of the code sequence analyzing parts 301the prediction error decoding section 302the mode decoding part 303the motion compensation decoding part 305the moving vector storage part 306the frame memory 307the add operation part 308the switches 309 and 310and the video decoding device that comprises the variable-length decoding section 311.
[0036]
Belowthe decoding processing of a forward prediction reference mark-ized picture (P picture) is explained.
A code sequence is inputted into the code sequence analyzing parts 301. In the code sequence analyzing parts 301various data is extracted from the inputted code sequence. Various data is informationmotion vector informationetc. of mode select here. The information on the extracted mode select is outputted to the mode decoding part 303. The extracted motion vector information is outputted to the motion compensation decoding part 305. Prediction error coding data is outputted to the variable length decoding part 311.
[0037]
With reference to the information on the mode select extracted from the code sequencethe switches 309 and 710 are controlled by the mode decoding part 303. When mode select is the coding in a pictureit controls to connect the switch 309 to a and to connect the switch 710 to c. When mode select is prediction coding between picturesit controls to connect the switch 309 to b and to connect the switch 710 to d.
[0038]
In the mode decoding part 303the information on mode select is outputted also to a motion compensation section. Belowthe case where mode select is prediction coding between pictures is explained.
[0039]
In the variable length decoding part 311variable-length decoding is given to the inputted prediction error coding data. The data given variable-length decoding is outputted to the prediction error decoding section 302.
[0040]

In the prediction error decoding section 302a prediction error image is generated inverse quantization processing and by performing reverse frequency conversion to the inputted data. Herereverse frequency conversion shall be performed based on the size of the motion compensation determined in the mode selection part 109. For examplewhen frequency conversion is carried out in the size of 8x8 when a motion compensation is carried out in 8x8 or more sizesand a motion compensation is carried out in less than 8x8 sizefrequency conversion shall be carried out in the same size as a motion compensation. The generated prediction error image is outputted to the switch 309. Heresince the switch 309 is connected to ba prediction error image is outputted to the add operation part 308.
[0041]
The motion compensation decoding part 305 performs decoding processing to the coded motion vector which was inputted from the variable-length decoding section 311. And based on the decrypted motion vectora frame memory 307 lost-motion compensation picture is acquired. Thusthe generated motion compensation picture is outputted to the add operation part 308.
[0042]
In the add operation part 308the inputted prediction error image and a motion compensation picture are addedand a decryption picture is generated. The generated decryption picture is outputted to the frame memory 307 via the switch 310.
[0043]
Nowdetails are explained below about operation of the code string generation part 104 in the video coding equipment explained aboveand the variable-length decoding section 311 in a video decoding device.
[0044]
Firstin the code string generation part 104 or the variable-length decoding section 311how to code or decrypt the number of the significant coefficient of each block with a CAVLC method is explained.
[0045]
In coding or decrypting the number of the significant coefficient of each blockit refers to the number of the significant coefficient of peripheral blocks. Herethe case where the block located in an object block top and the left is used as peripheral blocks is explained. All peripheral blocks are in a screenand supposing it is in the same slicewhen coding or decrypting the number of the significant coefficient of an object blocka variable-length-coding (decryption) table is determined using the number of the significant coefficient of peripheral blocks. Herewhen the maximum numbers of the maximum number of the significant coefficient of an object block and the significant coefficient of peripheral blocks differit asks for the number of the

significant coefficient of peripheral blocks so that the maximum number of the significant coefficient of an object block and peripheral blocks may be coincided. If the maximum of the number of the significant coefficient of an object block is set to N here (for examplewhen the size of an object block is 8x8) It is determined that the variable-length-coding (decryption) table said that it is set to 64and that N would use VLC2 of drawing 4 if the number of the significant coefficient obtained with reference to peripheral blocks is N / less than [8]it is VLC0 of drawing 4and less than [more than N/8N/4] and it is VLC1 of drawing 4and [N / more than 4]. In drawing 4even when the number of a significant coefficient is 16the variable-length-coding (decryption) table is shownbut these tables presuppose here that what the number of the significant coefficient extended to 17 or more is used. Although explained using drawing 2 belowin drawing 2the block C presupposes that it is the block which is trying to perform variable length coding or variable-length decryption.

[0046]

The 1st example is explained using drawing 2 (a). In drawing 2 (a)the block A1A2B1and B-2 serve as peripheral blocks located in the left of the block Cand a top. The block C has a size of 8x8and peripheral blocks presuppose it here that it has a size of 8x4. In this casethe sum of the number of the significant coefficient of the block B1 and B-2 is used as the number of the significant coefficient of a block located after the block Cusing the sum of the number of a significant coefficient with the blocks A1 and A2 as the number of the significant coefficient of a block located in the left of the block C. And at the average value of the number of the significant coefficient of a block located in the left of the block Cand a topi.e.hereThe average value of the sum of the number of the significant coefficient of block A1 and A2 and the sum of the number of the significant coefficient of the block B1 and B-2 is calculatedand this average value determines the variable-length-coding (decryption) table at the time of coding the number of the significant coefficient of the block C (decryption). Herethe number of the significant coefficient of the block B1 which adjoins the block C may be doubled and used instead of using the sum of the number of the significant coefficient of the block B1 and B-2.

[0047]

The 2nd example is explained using drawing 2 (b). In drawing 2 (b)the block A1A2A3A4B1B-2B3and B4 serve as peripheral blocks located in the left of the block Cand a top. The block C has a size of 8x8and the block A1A2A3A4B1B-2B3and B4 presuppose it here that it has a size of 4x4. In this casethe sum of the number of the significant coefficient of the block B1B-2B3and B4 is used as the number of the significant coefficient of a block located after the

block Cusing the sum of the number of the block A1A2A3and the significant coefficient of A4 as the number of the significant coefficient of a block located in the left of the block C. And at the average value of the number of the significant coefficient of a block located in the left of the block Cand a topi.e.hereThe average value of the sum of the number of the block A1A2A3and the significant coefficient of A4 and the sum of the number of the significant coefficient of the block B1B-2B3and B4 is calculatedand this average value determines the variable-length-coding (decryption) table at the time of coding the number of the significant coefficient of the block C (decryption). Here instead of using the sum of the number of A1A2A3and the significant coefficient of A4The sum twice value [the block B3] of the number of the significant coefficient of B4 etc. which adjoin the block C may be used instead of using the sum of the number of the sum twice value [the block A2 and] of the number of the significant coefficient of A4 which adjoin the block Cand the significant coefficient of the block B1B-2B3and B4.
[0048]
The 3rd example is explained using drawing 2 (c). In drawing 2 (c)the blocks A and B turn into peripheral blocks located in the left of the block Cand a top. The block C has a size of 8x4and presupposes the blocks A and B here that it has a size of 8x8. In this caseone half of the values of the number of the significant coefficient of the block B are used as the number of the significant coefficient of a block located after the block Cusing one half of the values of the number of the significant coefficient of the block A as the number of the significant coefficient of a block located in the left of the block C. And at the average value of the number of the significant coefficient of a block located in the left of the block Cand a topi.e.hereThe average value of one half of the values of the number of the significant coefficient of the block A and one half of the values of the number of the significant coefficient of the block B is calculatedand this average value determines the variable-length-coding (decryption) table at the time of coding the number of the significant coefficient of the block C (decryption).
[0049]
The 4th example is explained using drawing 2 (d). In drawing 2 (d)the block A1A2B1and B-2 serve as peripheral blocks located in the left of the block Cand a top. The block C has a size of 8x4and the block A1A2B1and B-2 presuppose it here that it has a size of 4x8. In this caseone half of the values of the sum of the number of the significant coefficient of the block B1 and B-2 are used as the number of the significant coefficient of a block located after the block Cusing one half of the values of the sum of the number of the significant coefficient of block A1 and A2 as the number of the significant coefficient of a block located in the left of the block C. And at the average

value of the number of the significant coefficient of a block located in the left of the block Cand a topi.e.hereThe average value of one half of the values of the sum of the number of the significant coefficient of block A1 and A2 and one half of the values of the sum of the number of the significant coefficient of the block B1 and B-2 is calculatedand this average value determines the variable-length-coding (decryption) table at the time of coding the number of the significant coefficient of the block C (decryption). Herethe number of either significant coefficient of the block B1 and B-2etc. may be used instead of using the sum of the number of the number of one significant coefficient of block A1 and A2and the significant coefficient of the block B1 and B-2 instead of using the sum of the number of the significant coefficient of A1 and A2.

[0050]

The 5th example is explained using drawing 2 (e). In drawing 2 (e)the block A1A2A3A4B1B-2B3and B4 serve as peripheral blocks located in the left of the block Cand a top. The block C has a size of 8x4and the block A1A2A3A4B1B-2B3and B4 presuppose it here that it has a size of 4x4. In this casethe sum of the number of the significant coefficient of the block B3 and B4 is used as the number of the significant coefficient of a block located after the block Cusing the sum of the number of the significant coefficient of block A1 and A2 as the number of the significant coefficient of a block located in the left of the block C. And at the average value of the number of the significant coefficient of a block located in the left of the block Cand a topi.e.hereThe average value of the sum of the number of the significant coefficient of block A1 and A2 and the sum of the number of the significant coefficient of the block B3 and B4 is calculatedand this average value determines the variable-length-coding (decryption) table at the time of coding the number of the significant coefficient of the block C (decryption). Here instead of using the sum of the number of the significant coefficient of A1 and A2 One half of the values of the sum of the number of the block A1A2A3and the significant coefficient of A4One half of the values of the sum of the number of the significant coefficient of the block B1B-2B3and B4etc. may be used instead of using the sum of the number of the significant coefficient of the block B3 and B4.

[0051]

The 6th example is explained using drawing 2 (f). In drawing 2 (f)the blocks A and B turn into peripheral blocks located in the left of the block Cand a top. The block C has a size of 4x4and presupposes the blocks A and B here that it has a size of 8x8. In this caseone fourth of the values of the number of the significant coefficient of the block B are used as the number of the significant coefficient of a block located after the block Cusing one fourth

of the values of the number of the significant coefficient of the block A as the number of the significant coefficient of a block located in the left of the block C. And at the average value of the number of the significant coefficient of a block located in the left of the block Cand a topi.e.hereThe average value of one fourth of the values of the number of the significant coefficient of the block A and one fourth of the values of the number of the significant coefficient of the block B is calculatedand this average value determines the variable-length-coding (decryption) table at the time of coding the number of the significant coefficient of the block C (decryption).
[0052]
The 7th example is explained using drawing 2 (g). In drawing 2 (g)the block A1A2B1and B-2 serve as peripheral blocks located in the left of the block Cand a top. Suppose the block C here that it has a size of 4x4 and has the block A1A2B1B-2and a size of 4x8. In this caseone half of the values of the number of the significant coefficient of the block B1 are used as the number of the significant coefficient of a block located after the block Cusing one half of the values of the number of the significant coefficient of the block A2 as the number of the significant coefficient of a block located in the left of the block C. And at the average value of the number of the significant coefficient of a block located in the left of the block Cand a topi.e.hereThe average value of one half of the values of the number of the significant coefficient of the block A2 and one half of the values of the number of the significant coefficient of the block B1 is calculatedand this average value determines the variable-length-coding (decryption) table at the time of coding the number of the significant coefficient of the block C (decryption). Hereone fourth of the values of the sum of the number of the significant coefficient of the block B1 and B-2etc. may be used instead of using one fourth of the values of the sum of the number of the significant coefficient of block A1 and A2and one half of the values of the number of the significant coefficient of the block B1 instead of using one half of the values of the number of the significant coefficient of A2.
[0053]
Nextin the code string generation part 104 or the variable-length decoding section 311how to code or decrypt the bit (CBP bit) which shows whether each block has a significant coefficient with a CABAC method is explained.
[0054]
When coding or decrypting the CBP bit of each blockthe CBP bit of peripheral blocks is referred to. Herethe case where the block located in an object block top and the left is used as peripheral blocks is explained. Supposing all peripheral blocks are in a screenand it is in the same slice and it is the same kind as a coding (decryption) object blockWhen coding or decrypting the

CBP bit of an object blockthe existence of the significant coefficient of peripheral blocks determines the probability table in the case of variable length coding (decryption). In this case. [whether the total value of the number of the significant coefficient of a block located in the left of an object block is 0and] And it asks for whether the total value of the number of the significant coefficient of a block located on an object block is 0and any of four kinds of combination of ** they areand the probability table used when carrying out arithmetic coding of the CBP bit of an object block by it is chosen from four kinds. Herewhen the maximum numbers of the maximum number of the significant coefficient of an object block and the significant coefficient of peripheral blocks differit asks for a CBP bit so that the maximum number of the significant coefficient of an object block and peripheral blocks may be coincided. Although explained using drawing 2 belowin drawing 2the block C presupposes that it is the block which is trying to perform variable length coding or variable-length decryption.

[0055]

The 1st example is explained using drawing 2 (a). In drawing 2 (a)the block A1A2B1and B-2 are peripheral blocks located in the left of the block Cand a toprespectively. In this caseask for whether the total value of the number of the significant coefficient of whether the total value of the number of a significant coefficient with the blocks A1 and A2 is 0the block B1and B-2 is 0and any of four kinds of combination of ** they areand by it. The probability table used when carrying out arithmetic coding of the CBP bit of the block C is chosen. . [whether the sum of the number of a significant coefficient with the blocks A1 and A2 is 0 in this caseand] The decision criterion whether the number of the significant coefficient of the block A1 (or block A2) is 0 instead of using the decision criterion to sayInstead of using the decision criterion whether the sum of the number of the significant coefficient of the block B1 and B-2 is 0the decision criterion whether the number of the significant coefficient of the block B1 (or block B-2) is 0 may be used.

[0056]

The 2nd example is explained using drawing 2 (b). In drawing 2 (b)the block A1A2A3A4B1B-2B3and B4 are peripheral blocks located in the left of the block Cand a toprespectively. In this case. [whether the total value of the number of the significant coefficient of the block A1A2A3and A3 is 0and] And it asks for whether the total value of the number of a significant coefficient with the block B1B-2B3and B4 is 0and any of four kinds of combination of ** they areand the probability table used when carrying out arithmetic coding of the CBP bit of the block C by it is chosen. . [whether the sum of the number of the block A1A2A3and the significant coefficient of A4 is 0 in this caseand] The decision criterion whether the sum of the number of the significant

coefficient of the block A2 which adjoins the block Cand A4 is 0 instead of using the decision criterion to sayThe decision criterion whether the sum of the number of the significant coefficient of the block B3 and B4 which adjoin the block C is 0 may be used instead of using the decision criterion whether the sum of the number of the significant coefficient of the block B1B-2B3and B4 is 0.

[0057]

The 3rd example is explained using drawing 2 (c). In drawing 2 (c)the blocks A and B are peripheral blocks located in the left of the block Cand a toprespectively. In this caseit asks for whether the number of the significant coefficient of whether the number of the significant coefficient of the block A is 0 and the block B is 0and any of four kinds of combination of ** they areand the probability table used when carrying out arithmetic coding of the CBP bit of the block C by it is chosen. . [whether the number of the significant coefficient of the block A (block B) is 0 in this caseand] ****** [that one half of the number of the significant coefficient of the block A (block B) is 0 instead of using the decision criterion to say] -- the decision criterion to say and the decision criterion whether the number of the significant coefficient of the block A (block B) is beyond a predetermined value or it is the following may be used.

[0058]

The 4th example is explained using drawing 2 (d). In drawing 2 (d)the block A1A2B1and B-2 are peripheral blocks located in the left of the block Cand a toprespectively. In this caseask for whether the sum of the number of the significant coefficient of whether the sum of the number of a significant coefficient with the blocks A1 and A2 is 0the block B1and B-2 is 0and any of four kinds of combination of ** they areand by it. The probability table used when carrying out arithmetic coding of the CBP bit of the block C is chosen. . [whether the sum of the number of the significant coefficient of the blocks A1 and A2 (the block B1 and B-2) is 0 in this caseand] ****** [that one half of the sums of the number of the significant coefficient of the blocks A1 and A2 (the block B1 and B-2) is 0 instead of using the decision criterion to say] -- the decision criterion to say. The decision criterion whether the number of the significant coefficient of the blocks A1 and A2 (the block B1 and B-2) is beyond a predetermined value or it is the following may be used.

[0059]

The 5th example is explained using drawing 2 (e). In drawing 2 (e)the block A1A2A3A4B1B-2B3and B4 are peripheral blocks located in the left of the block Cand a toprespectively. In this caseask for whether the sum of the number of the significant coefficient of whether the sum of the number of a significant coefficient with the blocks A1 and A2 is 0the block B3and B4 is 0and any of

four kinds of combination of ** they areand by it. The probability table used when carrying out arithmetic coding of the CBP bit of the block C is chosen. . [whether the sum of the number of the significant coefficient of the blocks A1 and A2 is 0 in this caseand] Instead of using the decision criterion to saythe block A1A2A3the sum of the number of the significant coefficient of A4Or. [whether it is whether one half of the sums is 0and beyond a predetermined value or it is the followingand] . [whether the sum of the number of the significant coefficient of a decision criterionand the block B3 and B4 to say is 0and] Instead of using the decision criterion to saythe decision criterion whether to be whether one half of the sums (omission value) is 0 and beyond [the block B1B-2 B3the sum of the number of the significant coefficient of B4or] a predetermined value or to be the following etc. may be used.

[0060]

The 6th example is explained using drawing 2 (f). In drawing 2 (f)the blocks A and B are peripheral blocks located in the left of the block Cand a toprespectively. In this caseit asks for whether the number of the significant coefficient of whether the number of the significant coefficient of the block A is 0 and the block B is 0and any of four kinds of combination of ** they areand the probability table used when carrying out arithmetic coding of the CBP bit of the block C by it is chosen. . [whether the number of the significant coefficient of the block A (block B) is 0 in this caseand] ****** [that one fourth of the number of the significant coefficient of the block A (block B) is 0 instead of using the decision criterion to say] -- the decision criterion to saythe decision criterion whether the number of the significant coefficient of the block A (block B) is beyond a predetermined value or it is the followingetc. may be used.

[0061]

The 7th example is explained using drawing 2 (g). In drawing 2 (g)the block A1A2B1and B-2 are peripheral blocks located in the left of the block Cand a toprespectively. In this caseit asks for whether the number of the significant coefficient of whether the number of the significant coefficient of the block A2 is 0 and the block B1 is 0and any of four kinds of combination of ** they areand the probability table used when carrying out arithmetic coding of the CBP bit of the block C by it is chosen. . [whether the number of the significant coefficient of the block A2 (block B1) is 0 in this caseand] ****** [that one half of the number of the significant coefficient of the block A2 (block B1) is 0 instead of using the decision criterion to say]. . [whether the number of the significant coefficient of the block A2 (block B1) is beyond a predetermined value or it is the followingand] The decision criterion whether to be whether one half of the sums (omission value) is 0 and

beyond [the sum of the number of the decision criterion to say and the significant coefficient of the blocks A1 and A2 (the block B1 and B-2) or] a predetermined value or to be the following etc. may be used.

[0062]

Nextin the code string generation part 104 or the variable-length decoding section 311the encoding method of the bit which shows whether each coefficient within a block is a significant coefficient with a CABAC method is explained. As it explained the coefficient within a block using drawing 6 in explanation of a conventional exampleafter rearranging at a predetermined scanning order forewordit is expressed using a SIG bit and a LAST bitand presupposes that arithmetic coding of these bits is carried out.

[0063]

In the 1st examplethe probability table at the time of carrying out arithmetic coding of a SIG bit and the LAST bit is prepared according to the size of a block. That isa probability table is prepared as it was called the probability table for 4x4 blocksthe probability table for 4x8 blocksthe probability table for 8x4 blocksand the probability table for 8x8 blocks. And a probability table is prepared for each coefficient position (position in scanning order) of every for every kind of each block. Thereforefor exampleto 4x4 blocks15 probability tables are used at a time to each of a SIG bit and a LAST bitand 63 probability tables use at a time to each of a SIG bit and a LAST bit to 8x8 blocks. Whenas for thisa significant coefficient exists in the final positionit is because it is not necessary to code this coefficient.

[0064]

Let the probability tables at the time of carrying out arithmetic coding of a SIG bit and the LAST bit be 1 set of tables regardless of the size of a block in the 2nd example. That isa probability table is prepared according to the greatest block size. Heresupposing the greatest block size is 8x863 probability tables will be used at a time to each of a SIG bit and a LAST bit. And to 4x4 blocksthe first 31 probability tables are used to 4x8 blocks or 8x4 blocks using the first 15 probability tables.

[0065]

As mentioned abovethe variable-length-coding method of this invention and a variable length decoding methodWhen coding the number of the significant coefficient of each block with a CAVLC method and the size of a coding target block differs from the size of peripheral blocksThe number of the significant coefficient of peripheral blocks is changed based on the ratio of the size of a coding target block and peripheral blocksand this changed value is used for the determination of a variable-length-coding table.

[0066]

By the above operationseven if it is a case where the size of a coding target

block differs from the size of peripheral blocksthe variable-length table according to the size of the coding target block can be determinedand improvement in encoding efficiency can be aimed at.

[0067]

When each block codes the bit (CBP bit) which shows whether it has a significant coefficient with a CABAC methodthe variable-length-coding method of this invention The size of a coding target blockWhen the sizes of peripheral blocks differthe existence of the significant coefficient of peripheral blocks is changed based on the ratio of the size of a coding target block and peripheral blocksand this changed value is used for the determination of the probability table used in a CABAC method.

[0068]

By the above operationseven if it is a case where the size of a coding target block differs from the size of peripheral blocksthe probability table according to the size of the coding target block can be determinedand improvement in encoding efficiency can be aimed at.

[0069]

When the bit which shows whether each coefficient within a block is a significant coefficient with a CABAC method carries out the encoding method of the variable-length-coding method of this inventionit prepares a probability table according to the size of a coding target blockand prepares the probability table of a different group for every block size. Or a probability table is prepared according to the maximum block size of a coding target blockand it is not concerned with the difference in the size of a blockbut the group of the same probability table is used.

[0070]

By the above operationseven if it is a case where a block has two or more sizesimprovement in encoding efficiency can be aimed at by having a group of a probability table for each size of a block. By preparing a probability table according to the maximum of the size of a blockand not being concerned with the difference in the size of a blockbut using the group of the same probability tablethe number of probability tables can be reduced and memory size can be made small.

[0071]

In this embodimentalthough a macro block is a unit of 16 pixels of level 16x perpendiculars and the motion compensation explained the case where it processed by a 16x16 to 4x4-pixel block unitanother pixel number may be sufficient as these units.

[0072]

In this embodimentalthough the case where frequency conversion was processed by one block unit of 8x88x44x8and 4x4 was explainedanother pixel number may be

sufficient as these units.
[0073]
In this embodimentalthough the case where a variable-length-coding table and a probability table were determined was explained with reference to the block located in the left and a top as peripheral blocks of a coding target blockthese peripheral blocks may be other blocks. For examplethere are a method of using the block of the upper right or the upper leftetc. etc.
[0074]
In this embodimentin explanation of a CAVLC methodalthough the case where three variable-length-coding tables shown in drawing 4 were used was explainedabout the number of a variable-length-coding tableand the composition of a tableit does not restrict to drawing 4. These values may be other values although the case where valuessuch as N/8 and N/4were used as a threshold to the number of the significant coefficient of peripheral blocks was explained. Different thresholds for every size of a coding target block may be used.
[0075]
What is necessary is just to make a decision of a variable-length-coding table or a probability table only using the peripheral blocks which fulfill conditionswhen these peripheral blocks do not fulfill this condition although peripheral blocks are in a screen and the case where it was in the same slice was explained by this embodiment.
[0076]
(Embodiment 2)
Nextwhen the frame structure or field structure is intermingled to an interlace signal in every macro block or every MBP (macro block pair; it is described as the following MBP) and it performs video coding and video decryptionHow to determine a context using a CAVLC method or a CABAC method is explained. MBP is the unit which summarized two macro blocks which adjoin up and down hereand detailed composition is mentioned later.
[0077]
Drawing 7 is a functional block diagram showing the composition of the video coding equipment concerning this Embodiment 2. In addition to the composition shown in the video coding equipment concerning Embodiment 1 mentioned abovein this Embodiment 2it has the block counter 701.
[0078]
This block counter 701 points to the output in the block unit which is the target of variable length coding to said frame memory 101and directs whether that object block is a boundary of MBP to said coding generation part 104. In the mode selection part 109it determines by any the MBP concerned shall be coded between the frame structure and field structureand the result is outputted to the code string generation part 104. The coding generation part

104 starts variable length coding of the object block concerning this Embodiment 2 using the boundary information of MBP outputted from the block counter 701and the structure information on MBP outputted from the mode selection part 109. Overall operation of video coding equipment is the same as the operation mentioned above.

[0079]

Drawing 8 is an explanatory view showing the relation between the data structure of MBP coded by the frame structureand the data structure of MBP coded by field structure. In the figurea white round head shows the pixel on an odd number horizontal scanning lineand the black dot which carried out hatching with the slash shows the pixel on an even number horizontal scanning line. When MBP is started from each frame showing an inputted imagethe pixel on an odd number horizontal scanning line and the pixel on an even number horizontal scanning line are perpendicularly arranged by turns so that it may be shown in the center of drawing 8. When coding such MBP by the frame structurethe MBP concerned is processed every two macro block 1 and macro block 2. The MBP concerned is divided into the macro block MBt showing the top field at the time of carrying out an interlace to a horizontal scanning line directionand the macro block MBb showing a bottom field when coding by field structure.

[0080]

Drawing 9 is a flow chart which shows the big flow of the computational procedure in the case of the CAVLC method concerning this Embodiment 2 determining a contextand determining a corresponding VLC table.

[0081]

The physical relationship of the block A and the block B which is peripheral blocks of coding target block C is explained as the same thing as said drawing 5. Coding target block Cand peripheral-blocks A and B have a size of 4x4 pixels (coefficient)and explain the maximum of the number of the significant coefficient of each block as 16. The number of the significant coefficient of peripheral-blocks B located on NL and coding target block C in the number of the significant coefficient of peripheral-blocks A located in the left of coding target block C is set to NU.

[0082]

Firstthe code string generation part 104 determines number NL of the significant coefficient of object block A located in the left of coding target block C (Step 901). Nextthe number N of the significant coefficient of an object block is determined by determining the number of the significant coefficient NU of object block B located on coding target block C (Step 902)and finally using them NL and NU (Step 903).

[0083]

A decision of N is made by the method of mentioning laterand the VLC table corresponding to the value of N is determined as a VLC table used for a variable length code.
[0084]
Herethe relation of the number N of a significant coefficient and the VLC table which were determined eventually is as in the table shown in drawing 10for example. Herethe number N of a significant coefficient in the case of 0 to 2It is shown using the table of VLC0 shown in drawing 4 that the number N of a significant coefficient uses [in the number N of a significant coefficient / in the case of 3 to 10] the VLC table of VLC2 using the VLC table of VLC1 in the case of 11 to 16.
[0085]
Hereaftera procedure with each detailed step in the flow chart shown in drawing 9 is explained.
Drawing 11 is Step 901 in drawing 9and a flow chart which shows the details of the computational procedure (two kinds(a) and (b)) which is got blocked and calculates number NL of the significant coefficient of peripheral-blocks A.
[0086]
Firstwhen the 1st operation procedures are explained using drawing 11 (a)the code string generation part 104Since these two blocks are the same types if it investigates whether peripheral-blocks A located in the left of coding target block C is located in the same MBP (Step 1101) and is in the same MBPAs a number NL of the significant coefficient of peripheral-blocks Ait specifies by NL=Num (A) (Step 1104). Num(x) shows the number of the significant coefficient of the block x here. A type refers to the coding structure whether the target block is coded by field structureor to be coded by the frame structure.
[0087]
And when it is judged that peripheral-blocks A is not located in the same MBPperipheral-blocks A investigates whether it is MBP same type as object block C (Step 1102). As a resultwhen peripheral-blocks A and object block C are MBP(s) same typeit is considered as NL=Num (A) and (Step 1104)and when those types differit computes as NL=(Num(A)+Num (A')) /2 (Step 1103). Peripheral-blocks A' is the block corresponding to the block Aand mentions the detailed physical relationship later.
[0088]
Nextif it investigates whether peripheral-blocks A located in the left of coding target block C is located in the same MBP (Step 1101) and is in the same MBP when the 2nd operation procedures are explained using drawing 11 (b)It is considered as NL=Num (A) using the number of the significant coefficient of peripheral-blocks A (Step 1104)and when it is judged that peripheral-blocks A is not located in the same MBPperipheral-blocks A is

investigated in MBP same type as object block C (Step 1102). And peripheral-blocks A considers it as NL=Num (A) and (Step 1104)when it is MBP same type as object block Cand when those types differit is taken as NL=N-A (Not Available; unfixed) (Step 1105).
[0089]
Drawing 12 is a figure showing an example of arrangement of peripheral-blocks A in case coding target block C is field structure and the frame structureand A'.
Drawing 12 (a) shows the case where belong to MBP1201 by which coding target block C was coded by field structureand it belongs to MBP1202 by which peripheral-blocks A was coded by the frame structure. Peripheral-blocks A' will be located under peripheral-blocks A. This is because correspondence relations are determined so that the scanning line of the pixel belonging to each block may become the same so that MBP of the frame structure and field structure which were shown in drawing 8 may show. That issince the block A and A' distributethe number of the significant coefficient of the block A and A' has been used for the scanning line belonging to the block C as an NL used for determining the number of the significant coefficient of the block C.
[0090]
On the other handdrawing 12 (b) shows the case where belong to MBP1203 by which coding target block C was coded by the frame structureand it belongs to MBP1204 by which peripheral-blocks A was coded by field structure. Peripheral-blocks A' is located in the same relative position in MB located under MB to which peripheral blocks belong. Since the block A and A' distributethe reason as above-mentioned drawing 12 (a) this is the samei.e.the scanning line belonging to the block Cis for adopting the number of the significant coefficient of the block A and A' as an NL used for determining the number of the significant coefficient of the block C.
[0091]
Drawing 13 is Step 902 in drawing 9and a flow chart explaining the details of the computational procedure (two kinds(a) and (b)) which is got blocked and asks for the number NU of the significant coefficient of peripheral-blocks B using a CAVLC method.
[0092]
In drawing 13 (a) in which the 1st computational procedure is shownthe code string generation part 104 investigates whether the block or macro block located in peripheral-blocks B is located in the same MBP (Step 1301). Since these blocks serve as the same type when located in the same MBPit is considered as NU=Num (B) as the number NU of the significant coefficient of peripheral-blocks B (Step 1305). And when not located in the same MBPcoding target block C investigates whether it is the frame structure (Step 1302). In

being not the frame structure but field structureit investigates continuously whether peripheral-blocks B is the frame structure (Step 1303)and when peripheral-blocks B is the frame structureit is considered as NU=Num (B) and (Step 1305) as the number NU of the significant coefficient of peripheral-blocks B. When peripheral-blocks B is field structureit computes as Nu=(Num(B)+Num (B')) /2 as the number Nu of a significant coefficient (Step 1308).

[0093]

And when object block C is said field structureit investigates whether peripheral-blocks B is field structure (Step 1304)and when peripheral-blocks B is field structureit is considered as NU=Num (B') (Step 1306) as the number NU of a significant coefficient. On the other handwhen peripheral-blocks B is the frame structureit computes as the number Nu of a significant coefficient as NU=Num (B)or NU=(Num(B)+Num (B')) /2 (Step 1307). And it continues to said step 803 through said each step.

[0094]

In drawing 13 (b) in which the 2nd computational procedure is shown. When the block or macro block located in peripheral-blocks B investigates whether it is located in the same MBP (Step 1301) and is located in the same MBPSince these blocks are the same typesthey are made into NU=Num (B) as the number NU of the significant coefficient of peripheral-blocks B (Step 1305). And when not located in the same MBP. Coding target block C investigates whether it is the frame structure (Step 1302)and in not being the frame structureThenit investigates whether peripheral-blocks B is the frame structure (Step 1303)and when peripheral-blocks B is the frame structureit is considered as NU=N-A (unfixed) (Step 1305) as the number NU of a significant coefficient. When peripheral-blocks B is field structureit computes as Nu=(Num(B)+Num (B')) /2 as the number of a significant coefficient (Step 1308). And when object block C is said field structure. Investigate whether peripheral-blocks B is field structure (Step 1304)and when peripheral-blocks B is field structureWhile considering it as NU=Num (B') (Step 1306) as the number NU of a significant coefficientwhen peripheral-blocks B is the frame structureas the number Nu of a significant coefficientit is considered as NU=N-A (unfixed) (Step 1307)and continues to said step 903.

[0095]

Drawing 14 is a figure showing an example of arrangement of peripheral-blocks B in case coding target block C is field structure and the frame structureand B'.

[0096]

Drawing 14 (a) shows the case where belong to MBP1401 by which coding target block C was coded by field structureand it belongs to MBP1402 by which

peripheral-blocks B was coded by the frame structure. Peripheral-blocks B' is located on peripheral-blocks B. This so that MBP of the frame structure and field structure which were shown in drawing 8 may show the block C of field structure. Since it becomes the same as that of the block B which follows two length of the frame structureand B' as a spatial sizethe number of the significant coefficient of the block B and B' has been adopted as NU used for determining the number of the significant coefficient of the block C. Howeverspatiallysince it is discontinuous to the block C and block B' as shown in S1307NU=Num (B) or NU = (Num(B)+Num (B')) / 2and two kinds of calculation methods can be considered.

[0097]

On the other handdrawing 14 (b) shows the case where belong to MBP1401 by which coding target block C was coded by field structureand it belongs to MBP1403 by which peripheral-blocks B was also coded by field structure. Peripheral-blocks B' is located in the same relative position in MB located on MB to which peripheral-blocks B belongs. Since the block C and B' belong to MB coded with the same kind of field (top field/bottom field) structurethis is for adopting the number of the significant coefficient of block B' as NU used for determining the number of the significant coefficient of the block C.

[0098]

Further on the other handdrawing 14 (c) shows the case where belong to MBP1404 by which coding target block C was coded by the frame structureand it belongs to MBP1403 by which peripheral blocks were coded by field structure. Peripheral-blocks B' is located in the same relative position in MB located on MB to which peripheral-blocks B belongs. Since the spatial position in MBP is the same fieldthe block B and B' of this are for adopting the number of the significant coefficient of the block B and B' as NU used for determining the number of the significant coefficient of the block C.

[0099]

Nextdrawing 15 is Step 903 in drawing 9and a flow chart which shows the details of the decision procedure (two kinds(a) and (b)) of the VLC table which is got blocked and applied to this Embodiment 2.

[0100]

In drawing 15 (a) in which the 1st decision procedure is shownthe code string generation part 104 determines the number N of the significant coefficient of coding target block C by N = (NL+NU) / 2 using the number NL and NU of the significant coefficient of the object blocks B and A first (Step 1501). Nextit becomes possible to determine a VLC table using the table shown in this N and said drawing 10 (Step 1502).

[0101]

In drawing 15 (b) in which the 2nd decision procedure is shownEither NL or NU

investigates first whether it is N-A (unfixed) (Step 1503)and when NL and NU are unfixedthe code string generation part 104 it[it] For exampleadopt a default of using the VLC table of N= 0 (Step 1504)and on the other handwhen only NU is unfixedConsider it as N=NLdetermine the VLC table corresponding to the N (Step 1505)and further on the other handwhen only NL is unfixedit being considered as N=NUand the N determining a VLC table (Step 1506)andWhen neither NL nor NU is unfixed (i.e.when having determined both NL and NU)otherscan be adoptedit can compute as N=(NL+NU) /2and a VLC table can be determined (Step 1507).
[0102]
Nextthe decision procedure of the probability table used for the context of the CABAC method concerning this Embodiment 2 is explained.
Drawing 16 is a flow chart which shows the big flow of the computational procedure in the case of the CABAC method concerning this Embodiment 2 determining a contextand determining a corresponding probability table. The code string generation part 104 determines first the context value ctxA of peripheral-blocks A located in the left of coding target block C (Step 1601)and determines the context value ctxB of peripheral-blocks B located on coding target block C next (Step 1602). And the context value ctxC of coding target block C is determined by using the value of these ctxA(s) and ctxB (Step 1603).
And variable length coding is performed using the probability table corresponding to the determined context value ctxC.
[0103]
Hereaftera procedure with each detailed step in the flow chart shown in drawing 16 is explained.
Drawing 17 is Step 1601 in drawing 16and a flow chart which shows the details of the computational procedure (two kinds(a) and (b)) which is got blocked and calculates the context value ctxA of peripheral-blocks A using a CABAC method. Herethe values which can be taken differ by what kind of informationincluding a CBP bitthe coding mode of a macro blocka reference picture numbera differential PCM parameteretc.a context value treats. For examplewhen a context is divided into 0 and 1 by the existence of the significant coefficient of each block when coding a CBP bit (bit which shows whether it has a significant coefficient)for examplethere is a significant coefficientit is set to 1and it is set to 0 when a significant coefficient is not contained. Thereforea context value here corresponds to the existence or nonexistence of a significant coefficient. In additionwhen coding the coding mode of a macro blockeach block is a skip blockor a context is the block coded by the direct modeor is divided into 0 and 1 by **respectively. A reference picture number and a differential PCM parameter are divided into 0 and 1 by whether it is 0.

[0104]
If the 1st computational procedure is explained using drawing 17 (a)the code string generation part 104 will investigate whether it is in the MBP as coding target block C with same block or macro block located in peripheral-blocks A (Step 1701). If it is in the same MBPit will be considered as ctxA=ctx (A) and (Step 1704) as the context value ctxA of peripheral-blocks A. ctx(x) shows the context value of the block x here.
[0105]
when peripheral-blocks A does not come out in the same MBP as coding target block Cit is investigated whether peripheral-blocks A is MBP of the type of the same structure as coding target block C (Step 1702). In this caseif it is a type of the same structureit will be considered as ctxA=ctx (A) and (Step 1704) as the context value ctxA of peripheral-blocks A. On the other handin being the block of the type with which the structures of peripheral-blocks A and object block C differit computes with context value ctxA=F1 (ctx (A)ctx (A')) as the context value ctxA of peripheral-blocks A (Step 1703). HereF1 is a function which performs a certain math operationfor exampleis F1(ab) =a+ba+2band a&b. And it continues to said step 1602.
[0106]
And if the 2nd operation procedures are explained using drawing 17 (b)the block or macro block located in peripheral-blocks A investigates whether it is in the same MBP as coding target block C (Step 1701)and if it is in the same MBPAs the context value ctxA of peripheral-blocks Ait is considered as ctxA=ctx (A) and (Step 1704)when peripheral-blocks A does not come out in the same MBP as coding target block Cperipheral-blocks A investigates whether it is MBP of the type of the same structure as coding target block C (Step 1702). In this caseif it is a type of the same structureas the context value ctxA of peripheral-blocks AWhile considering it as ctxA=ctx (A) and (Step 1704)in being the block of the type with which the structures of peripheral-blocks A and object block C differit sets the context value ctxA as a default value (Step 1705). As this default valueit is either of the values which a context value can takefor exampleis 0 or 1.
[0107]
Drawing 18 is Step 1602 in drawing 16and a flow chart which shows the details of the computational procedure (two kinds(a) and (b)) which is got blocked and calculates the context value of peripheral-blocks B using a CABAC method.
[0108]
In drawing 18 (a) in which the 1st computational procedure is shownthe block or macro block to which the code string generation part 104 is located in peripheral-blocks B investigates first whether it is MBP (Step 1801). When located in the same MBPit is considered as context value ctxB=ctx (B) and

(Step 1805). And when object block C is not located in the same MBP as peripheral-blocks Bit is investigated whether object block C is the frame structure (Step 1802). As a resultwhen object block C is the frame structureperipheral-blocks B investigates whether it is the frame structure (Step 1803). When peripheral-blocks B is the frame structureit is considered as context value ctxB=ctx (B) and (Step 1805). On the other handwhen object block C is the frame structure and peripheral-blocks B is field structureit is considered as context value ctxB=F1 (ctx (B)ctx (B')) (Step 1808).
[0109]
When object block C is field structure nextperipheral-blocks B investigates whether it is field structure (Step 1804). When peripheral-blocks B is field structureit is considered as context value ctxB=ctx (B') (Step 1806). When object block C is field structure and peripheral-blocks B is the frame structureit is considered as context value ctxB=ctx (B) or ctxB=F1 (ctx (B)ctx (B')) (Step 1807). Processing of F1 becomes being the same as that of **** here. And it continues to said step 1603 through said each step.
[0110]
Drawing 19 is Step 1603 in drawing 16and a flow chart which shows the details of the decision procedure of the probability table which is got blocked and applied to this Embodiment 2.
In drawing 19it is a step following said drawing 18and the code string generation part 104 sets the context value of coding target block C to ctxC=F2 (ctx (A)ctx (B)) first (Step 1901). HereF2 is a function which performs a certain math operation like F1for exampleis F2(ab)=a+ba+2ba&baand b. Nexta probability table can be determined by using this ctxC (Step 1902).
[0111]
The deciding method of the context in the deciding method of a VLC table [in / not only on the video coding mentioned above but video decryptionand / the CAVLC method]and the CABAC methodIt becomes the operation in the variable length decoding part 311 shown in said drawing 3and the same operation as said code string generation part 104 is performed. . In the variable length decoding part 311when making the determination of a VLC tableand a decision of a contextare needed here. The information which shows whether a block is a boundary of MBP and whether MBP is coded with which structure of a frame or the field again is acquired from the code sequence analyzing parts 301.
[0112]
As mentioned abovein the variable-length-coding method and variable length decoding method concerning Embodiment 2when using a CAVLC method and a CABAC methodthe information on the significant coefficient of two or more peripheral blocks is used. Thereforethe selection method of the VLC table and probability table whose encoding efficiency improves more effectively is realizable. In

this Embodiment 2it cannot be overemphasized that the type of the structure of a macro block is mutually convertible for the frame structure and field structure for every MBP. The unit which chooses any of the frame structure and field structure may not be MBPfor exampleis good also considering a macro block as a unit.

[0113]

In the gestalt explained in this embodiment using drawing 9 and drawing 16After asking for the number or the context of a significant coefficient of a block located in the left-hand side of coding or a decryption object blockexplained the case where it asked for the number or the context of a significant coefficient of a block located in the coding or decryption object block upper partbut. These order may be reverse and influence does not do to the decision results of S1603 in S903 in drawing 9and drawing 16.

[0114]

Furthermorethe system using the application of the variable-length-coding method or a variable length decoding method and it which showed by the above-mentioned embodiment is explained here.

Drawing 20 is a block diagram showing the entire configuration of contents distribution system ex100 which realizes a contents distribution service. It divides into the size of a request of the offer area of communications serviceand the base stations ex107-ex110 which are fixed-wireless-access officesrespectively are installed in each cell.

[0115]

This contents distribution system ex100for example via Internet Service Provider ex102telephone network ex104and the base stations ex107-ex110 to Internet ex101Each apparatussuch as computer ex111PDA(personaldigital assistant) ex112camera ex113cellular-phone ex114and cellular-phone ex115 with a camerais connected.

[0116]

Howevercontents distribution system ex100 is not limited to combination like drawing 20but it may be made to connect it combining either. Direct continuation of each apparatus may be carried out to telephone network ex104without passing the base stations ex107-ex110 which are fixed-wireless-access offices.

[0117]

Camera ex113 is apparatus in which animation photography of a digital camcorder etc. is possible. A cellular phone A PDC (Personal Digital Communications) methodA CDMA (Code Division Multiple Access) methodA W-CDMA (Wideband-Code Division Multiple Access) methodOr it may be a portable telephone of a GSM (Global System for Mobile Communications) methodor PHS (Personal Handyphone System)and any may be sufficient.

[0118]
Streaming server ex103 is connected through camera ex113 to base station ex109and telephone network ex104and the live distribution based on the data which a user transmits using camera ex113 and by which coding processing was carried outetc. become possible. Even if it performs coding processing of the photoed data by camera ex113it may carry out by the server etc. which carry out transmitting processing of data. The video data photoed with the camera 116 may be transmitted to streaming server ex103 via computer ex111. Camera ex116 is apparatus which can photo still picturessuch as a digital cameraand an animation. In this casecoding of a video data may be performed by camera ex116it may carry out by computer ex111or whichever may be sufficient. Coding processing will be processed in LSIex117 which computer ex111 and camera ex116 have. The software for image coding and decryption may also be built into some storage media (CD-ROMa flexible diska hard disketc.) which are the recording media [in computer ex111 grade] which can be read. A video data may be transmitted by cellular-phone ex115 with a camera. The video data at this time is the data by which coding processing was carried out by LSI which cellular-phone ex115 has.
[0119]
In this contents distribution system ex100. While a user does coding processing of the contents (for exampleimage etc. which photoed the music live) currently photoed in camera ex113 and camera ex116 grade like the above-mentioned embodiment and transmits to streaming server ex103Streaming server ex103 carries out stream distribution of the above-mentioned contents data to a client with a demand. There are computer ex111 which can decrypt as a client the data by which coding processing was carried out [above-mentioned]PDAex112camera ex113and cellular-phone ex114 grade. Contents distribution system ex100 is a system which becomes realizable [individual broadcast] in doing in this way by being able to receive the coded data in a clientbeing able to reproducereceiving in real time in a clientdecrypting furtherand reproducing.
[0120]
What is necessary is just to use the variable length coding device or variable length decoding device shown by each above-mentioned embodiment for coding of each apparatus which constitutes this systemand decryption.
A cellular phone is explained as the example.
Drawing 21 is a figure showing cellular-phone ex115 using the variable-length-coding method and variable length decoding method which were explained by the above-mentioned embodiment. The image of antenna ex201 for cellular-phone ex115 to transmit and receive an electric wave between base station ex110a CCD cameraetc.The image photoed by camera part ex203 which can photograph a still

pictureand camera part ex203Indicator ex202such as a liquid crystal display which displays the data in which the image etc. which were received by antenna ex201 were decryptedthe body part which comprises operation key ex204 groupThe data of voice input part ex205such as a microphone for carrying out voice output part ex208such as a loudspeaker for carrying out voice responseand voice inputthe photoed animationor a still pictureIt has slot part ex206 for enabling wearing of archive-medium ex207 archive-medium ex207 for saving the coded data of the data of the received mailthe data of an animationor the data of a still pictureor the decrypted dataand cellular-phone ex115. EEPROM (Electrically Erasable and Programmable Read.) which is the nonvolatile memory which can be rewritten and eliminated electrically [archive-medium ex207] in the plastic case of an SD card etc. The flash memory element which is a kind of Only Memory is stored.

[0121]

Cellular-phone ex115 is explained using drawing 22. As opposed to main control part ex311 made as [control / each part of the body part provided with indicator ex202 and operation key ex204 / cellular-phone ex115 / in generalization]Power circuit part ex310operational input control-section ex304image encoding part ex312camera interface part ex303LCD (Liquid Crystal Display) control-section ex302image decoding part ex309demultiplexing part ex308Recording reproduction section ex307modulation and demodulation circuit unit ex306and voice processing part ex305 are mutually connected via synchronous bus ex313.

[0122]

Power circuit part ex310 will start digital portable telephone ex115 with a camera in the state where it can operateby supplying electric power from a battery pack to each partif clear back and a power key are made an ON state by a user's operation.

[0123]

Based on control of main control part ex311 which becomes by CPUROMRAMetc.cellular-phone ex115The audio signal which collected the sound by voice input part ex205 at the time of voice call mode is changed into digital sound data by voice processing part ex305Spectrum diffusion treatment of this is carried out by modulation and demodulation circuit unit ex306and after performing digital-to-analog-conversion processing and frequency conversion processing by transmitting and receiving circuit section ex301it transmits via antenna ex201. Portable telephone ex115 amplifies the input signal received by antenna ex201 at the time of voice call modeand performs frequency conversion processing and analog-to-digital-conversion processingAfter carrying out spectrum back-diffusion-of-gas processing by modulation and demodulation circuit unit ex306 and changing into an analog voice signal by voice

processing part ex305this is outputted via voice output part ex208.
[0124]
When transmitting an E-mail at the time of data communication modethe text data of the E-mail inputted by operation of operation key ex204 of a body part is sent out to main control part ex311 via operational input control-section ex304. Main control part ex311 carries out spectrum diffusion treatment of the text data by modulation and demodulation circuit unit ex306and after it performs digital-to-analog-conversion processing and frequency conversion processing by transmitting and receiving circuit section ex301it transmits to base station ex110 via antenna ex201.
[0125]
When transmitting image data at the time of data communication modethe image data picturized by camera part ex203 is supplied to image encoding part ex312 via camera interface part ex303. When not transmitting image datait is also possible to display directly the image data picturized by camera part ex203 on indicator ex202 via camera interface part ex303 and LCD control-section ex302.
[0126]
Image encoding part ex312 is the composition provided with the image encoding apparatus explained by the invention in this applicationBy carrying out compression encoding of the image data supplied from camera part ex203 with the encoding method used for the image encoding apparatus shown by the above-mentioned embodimentit changes into coded image data and this is sent out to demultiplexing part ex308. Portable telephone ex115 sends out simultaneously the sound which collected the sound by voice input part ex205 as digital voice data via voice processing part ex305 demultiplexing part ex308 during an image pick-up by camera part ex203 at this time.
[0127]
Demultiplexing part ex308 multiplexes the coded image data supplied from image encoding part ex312and the voice data supplied from voice processing part ex305 by a prescribed methodSpectrum diffusion treatment of the multiplexing data obtained as a result is carried out by modulation and demodulation circuit unit ex306and after performing digital-to-analog-conversion processing and frequency conversion processing by transmitting and receiving circuit section ex301it transmits via antenna ex201.
[0128]
When the data of the video file linked to the homepage etc. at the time of data communication mode is receivedSpectrum back-diffusion-of-gas processing of the input signal received from base station ex110 via antenna ex201 is carried out by modulation and demodulation circuit unit ex306and the multiplexing data obtained as a result is sent out to demultiplexing part ex308.

[0129]
In order to decrypt the multiplexing data received via antenna ex201Demultiplexing part ex308 is divided into the encoded bit streams of image dataand the encoded bit streams of voice data by separating multiplexing dataThe coded image data concerned is supplied to image decoding part ex309 via synchronous bus ex313and the voice data concerned is supplied to voice processing part ex305.
[0130]
Nextimage decoding part ex309 is the composition provided with the image decoding device explained by the invention in this applicationReproduction dynamic image data is generated by decoding the encoded bit streams of image data with the decoding method corresponding to the encoding method shown by the above-mentioned embodimentThis is supplied to indicator ex202 via LCD control-section ex302and the video data contained in the video file linkedfor example to the homepage by this is displayed. At this timesimultaneouslyafter voice processing part ex305 changes voice data into an analog voice signalthis is supplied to voice output part ex208andthereby****** voice data is reproduced by the video file linkedfor example to the homepage.
[0131]
It is not restricted to the example of the above-mentioned systembut a satellite and digital broadcasting by a terrestrial wave have become the center of attention recentlyand as shown in drawing 23even if the system for digital broadcasting also has few above-mentioned embodimentseither an image encoding apparatus or an image decoding device is incorporable. Specifically by broadcasting station ex409the encoded bit streams of video information are transmitted to communication or broadcasting satellite ex410 via an electric wave. Broadcasting satellite ex410 which received this sends the electric wave for broadcastand this electric wave is received by antenna ex406 of a home with satellite reception equipmentEncoded bit streams are decrypted with devicessuch as television (receiver) ex401 or set top box (STB) ex407and this is reproduced. It is possible to read the encoded bit streams recorded on storage-medium ex402 which is a recording mediumsuch as CD and DVDand to mount the image decoding device shown by the above-mentioned embodiment also in playback equipment ex403 to decrypt. In this casethe reproduced video signal is displayed on monitor ex404. An image decoding device is mounted in the set top box ex407 connected to cable ex405 for cable TVor antenna ex406 of a satellite/terrestrial broadcastingand the composition which reproduces this by monitor ex408 of television is also considered. At this timean image decoding device may also be incorporated not in a set top box but in television. It is also possible to reproduce an animation to the display of the car navigation ex413 grade which receives base station ex107 grade to a signal from satellite

ex410 by vehicle ex412 which has antenna ex411and vehicle ex412 has.
[0132]
A picture signal can be coded with the image encoding apparatus shown by the above-mentioned embodimentand it can also record on a recording medium. As an examplethere is recorder ex420such as a DVD recorder which records a picture signal on DVD disk ex421and a disk recorder recorded on a hard disk. It is also recordable on SD card ex422. If recorder ex420 is provided with the image decoding device shown by the above-mentioned embodimentthe picture signal recorded on DVD disk ex421 or SD card ex422 can be playedand it can display by monitor ex408.
[0133]
The composition of car navigation ex413 For examplethe inside of composition of being shown in drawing 22The composition except camera part ex203camera interface part ex303and image encoding part ex312 can be consideredand the same thing is considered also in computer ex111 or television (receiver) ex401 grade.
[0134]
The terminal of the above-mentioned cellular-phone ex114 grade can consider three kinds of mounting forms of the transmit terminal of only coding equipmentand the receiving terminal of only a decryption machine other than a transmitting and received type terminal with both coding equipment and a decryption machine.
[0135]
Thusit is possible to use for the apparatus system of the gap which wants to mention above the variable-length-coding method or variable length decoding method shown by the above-mentioned embodimentand the effect explained by the above-mentioned embodiment can be acquired by doing so.
[0136]
[Effect of the Invention]
As mentioned abovethe variable-length-coding method of this invention and a variable length decoding methodWhen coding the number of the significant coefficient of each block with a CAVLC method and the size of a coding target block differs from the size of peripheral blocksThe number of the significant coefficient of peripheral blocks is changed based on the ratio of the size of a coding target block and peripheral blocksand this changed value is used for the determination of a variable-length-coding table.
[0137]
By the above operationseven if it is a case where the size of a coding target block differs from the size of peripheral blocksthe variable-length table according to the size of the coding target block can be determinedand improvement in encoding efficiency can be aimed at.

[0138]
When each block codes the bit (CBP bit) which shows whether it has a significant coefficient with a CABAC methodthe variable-length-coding method of this invention The size of a coding target blockWhen the sizes of peripheral blocks differthe existence of the significant coefficient of peripheral blocks is changed based on the ratio of the size of a coding target block and peripheral blocksand this changed value is used for the determination of the probability table used in a CABAC method.
[0139]
By the above operationseven if it is a case where the size of a coding target block differs from the size of peripheral blocksthe probability table according to the size of the coding target block can be determinedand improvement in encoding efficiency can be aimed at.
[0140]
When the bit which shows whether each coefficient within a block is a significant coefficient with a CABAC method carries out the encoding method of the variable-length-coding method of this inventionit prepares a probability table according to the size of a coding target blockand prepares the probability table of a different group for every block size. Or a probability table is prepared according to the maximum block size of a coding target blockand it is not concerned with the difference in the size of a blockbut the group of the same probability table is used.
[0141]
By the above operationseven if it is a case where a block has two or more sizesimprovement in encoding efficiency can be aimed at by having a group of a probability table for each size of a block. By preparing a probability table according to the maximum of the size of a blockand not being concerned with the difference in the size of a blockbut using the group of the same probability tablethe number of probability tables can be reduced and memory size can be made small.
[0142]
When a picture signal is an interlace and a CAVLC method and a CABAC method are used for this invention as variable length coding and a decoding methodBased on coincidence and a difference of coding structure of whether an object block and peripheral blocks are coded by the frame structureor to be coded by field structurethe variable-length-coding table and the probability table are determined. Even if it is a case where the block of the frame structure and field structure is intermingleda VLC table and a probability table are uniquely determined by thisand encoding efficiency improves by it.
[Brief Description of the Drawings]
[Drawing 1]The block diagram for describing an embodiment of the invention

[Drawing 2]The mimetic diagram for describing an embodiment of the invention
[Drawing 3]The block diagram for describing an embodiment of the invention
[Drawing 4]The mimetic diagram for explaining an embodiment of the invention and a conventional example
[Drawing 5]The mimetic diagram for explaining a conventional example
[Drawing 6]The mimetic diagram for explaining a conventional example
[Drawing 7]The functional block diagram showing the composition of the video coding equipment concerning this Embodiment 2
[Drawing 8]The explanatory view showing the relation between the data structure of MBP coded by the frame structure concerning Embodiment 2and the data structure of MBP coded by field structure
[Drawing 9]The flow chart which shows the big flow of the computational procedure in the case of the CAVLC method concerning Embodiment 2 determining a contextand determining a corresponding VLC table
[Drawing 10]The table which illustrates the relation of the number of a significant coefficient and the VLC table concerning Embodiment 2
[Drawing 11]The flow chart which shows the details of the computational procedure (two kinds(a) and (b)) which calculates number NL of the significant coefficient of peripheral-blocks A concerning Embodiment 2
[Drawing 12]The figure showing an example of arrangement of peripheral-blocks A in case coding target block C concerning Embodiment 2 is field structure and the frame structureand A'
[Drawing 13]The flow chart explaining the details of the computational procedure (two kinds(a) and (b)) which asks for the number NU of the significant coefficient of peripheral-blocks B using the CAVLC method concerning Embodiment 2
[Drawing 14]The figure showing an example of arrangement of peripheral-blocks B in case coding target block C concerning Embodiment 2 is field structure and the frame structureand B'
[Drawing 15]The flow chart which shows the details of the decision procedure (two kinds(a) and (b)) of the VLC table concerning this Embodiment 2
[Drawing 16]The flow chart which shows the big flow of the computational procedure in the case of the CABAC method concerning Embodiment 2 determining a contextand determining a corresponding probability table
[Drawing 17]The flow chart which shows the details of the computational procedure (two kinds(a) and (b)) which calculates the context value ctxA of peripheral-blocks A using the CABAC method concerning Embodiment 2
[Drawing 18]The flow chart which shows the details of the computational procedure (two kinds(a) and (b)) which calculates the context value of peripheral-blocks B using the CABAC method concerning Embodiment 2
[Drawing 19]The flow chart which shows the details of the decision procedure

of the probability table concerning this Embodiment 2
[Drawing 20]The block diagram showing the entire configuration of a contents distribution system
[Drawing 21]The example of the cellular phone using a video encoding method and a video decoding method
[Drawing 22]The block diagram of a cellular phone
[Drawing 23]The example of the system for digital broadcasting
[Drawing 24]The reference drawing showing the method of calculation of the conventional probability table
[Description of Notations]
101 and 107 Frame memory
102 Difference operation part
103 Prediction error coding part
104 Code string generation part
105 Prediction error decoding section
106 Add operation part
108 Motion vector primary detecting element
109 Mode selection part
701 Block counter
MBP Macro block pair

DESCRIPTION OF DRAWINGS

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[Drawing 16]The flow chart which shows the big flow of the computational procedure in the case of the CABAC method concerning Embodiment 2 determining a contextand determining a corresponding probability table
[Drawing 17]The flow chart which shows the details of the computational procedure (two kinds(a) and (b)) which calculates the context value ctxA of peripheral-blocks A using the CABAC method concerning Embodiment 2
[Drawing 18]The flow chart which shows the details of the computational procedure (two kinds(a) and (b)) which calculates the context value of peripheral-blocks B using the CABAC method concerning Embodiment 2
[Drawing 19]The flow chart which shows the details of the decision procedure of the probability table concerning this Embodiment 2
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